Device for rolling up a web of material in sheet form

The invention relates to an device for rolling up a web of elastic material in sheet form, comprising a frame, a rolling-up member having an essentially regularly curved support surface that is mounted on the frame such that it can rotate, drive means for making the rolling-up member rotate and securing means for securing one end of the material in sheet form that is to be rolled up to the rolling-up member.

Devices of this type are generally known and are used in many different fields. In particular, the procedure involved can be rolling up thin sheet metal, such as aluminium, that is used for the production of skin panels for aviation and aerospace. In this field so-called laminates of alternating layers of aluminium and fibre-reinforced adhesive layers are being used to an ever increasing extent. Such a skin material has excellent mechanical properties in combination with a relatively low weight. Important properties are, for example, a high rigidity and strength as well as a high nick resistance to cracking.

The sheet material is usually supplied in the form of a roll and cut to a specific length that is matched to the dimensions of the panel to be produced. The panels that have thus been cut to length in advance must be stored in the interim awaiting final processing thereof into the ultimate panels for, for example, the skin or the wings of an aircraft. Work must always be carried out very carefully during these treatments because the quality of the panels rapidly deteriorates as a result of damage to the sheet material thereof. In view of the elastic nature of the material in sheet form, such a careful treatment is not always easy and also gives rise to a delay in the production process.

The aim of the invention is, therefore, to provide a device with which rapid and careful treatment of the material in sheet form is ensured. This aim is realised in that the securing means comprise two clamping jaws that are oriented axially with respect to the support surface and that can be moved between an open position for inserting or releasing the material in sheet form and a closed position for clamping the material in sheet form, in which open position the clamping jaws enclose a slit-shaped opening in the support surface.

By means of a suitable embodiment of the clamping jaws, the material can be reliably gripped over the full width thereof and then rolled up in a uniform manner. As a result the material is largely protected against scratching, folding and the like. After all the material has been rolled up, a tape or something similar can be fitted around the roll to hold the roll.

In the case of the device according to the invention the support surface of the rolling-up member is preferably interrupted by an axial slit, on either side of which the clamping jaws are located. In this case one of the clamping jaws can be defined by a fixed part of the support surface and the other clamping jaw by a movable part of the support surface. The clamping jaws then form an integral component of the support surface of the rolling-up member, as a result of which uniform support of the roll on said support surface is ensured.

The movable part of the support surface can be fixed by means of an axial hinge to the fixed part of the support surface. Other embodiments are, however, also possible. For instance, the mobility of the one part could also be obtained by an elastic deformation thereof, instead of by a hinge movement.

An actuating device for driving the movable part can be located between the fixed part and the movable part of the support surface. This actuating device can comprise, for example, a piston/cylinder device.

Preferably, the movable part has a jaw with an outward facing engagement surface and the fixed part has an opposing jaw with an inward facing engagement surface. As a result the material in sheet form can be fed to the rolling-up member easily and without obstacles and pushed under the inward-facing jaw of the fixed part. The engagement surfaces can have a structure that increases friction, such as profiling or a rubber layer, for reliable clamping of the material in sheet form.

According to a preferred embodiment the movable part has a base as well as a covering on the outside of the base. The covering preferably comprises a plate that has essentially the same radius of curvature as the fixed part. In this case the functions of powerfully clamping the material in sheet form and regular guiding thereof are split. In this case the base is matched to the forces required for clamping, whilst the covering plate has the desired external shape that provides correct guiding and support for the material in sheet form.

Furthermore, an auxiliary roller for pressing the material in sheet form against the rolling-up member can extend parallel to the rolling-up member. By this means the material in sheet form can be wound tightly on the rolling-up member, so that mutual movement of, and thus damage to, the windings of the material can be prevented. The auxiliary roller can move towards and away from the rolling-up member. The auxiliary roller can comprise a series of rollers with a relatively soft surface positioned alongside one another.

The invention will be explained in more detail below with reference to an illustrative embodiment of the device shown in the figures.

Figure 1 shows a first perspective view of the device according to the invention.

Figure 2 shows a second perspective view.

Figure 3 shows a side view of the rolling-up member with open clamping jaws.

Figure 4 shows a side view of the rolling-up member with closed clamping jaws.

The device according to the invention shown in Figures 1 and 2 comprises a frame 1 in which the rolling-up member 2 is mounted such that it is freely suspended. This means that the rolling-up member 2 is supported at the one end 3 in the frame 1 such that it can rotate and is free at the other end 4. As shown in Figure 1, the free end 4 can be constrained by a flap 5 that can be flapped out of the way.

A support table 6 for feeding a material in sheet form is arranged in front of the frame, which support table 6 can be folded away into the position shown in Figure 2.

As is also shown on a larger scale in Figure 3, the rolling-up member has two clamping jaws 7, 8 which enclose an axial cut 9. The one clamping jaw 7 is defined by a fixed part of the support surface of the rolling-up member 2, which support surface is indicated in its entirety by 11; the other clamping jaw 8 is defined by a movable part 12 of said support surface 11. The movable part 12 is joined by means of a hinge 13 to the fixed part 10 of the support surface 11.

The movable part 12 of the support surface 11 is made up of a rigid base 14, which is joined by means of the hinge 13 to the fixed part 10, and a cover plate 15, which extends with regular curvature over the base 14. A number of operating members in the form of piston/cylinder devices 16 are fixed to the base 14, the other end of which piston/cylinder devices 16 bears against the frame of the rolling-up member 2, which frame is indicated in its entirety by 17.

The open position of the clamping jaws 7, 8 shown in Figure 3 is obtained by retracting the piston/cylinder devices 16. In this position the surfaces of the clamping jaws 7, 8 that are covered with a friction material 18, for example profiling or a rubber layer, enclose a slit 9.

A material in sheet form can then be pushed over the table 6 between the clamping jaws 7, 8, after which the piston/cylinder devices are actuated and the jaws are clamped against one another, as shown in Figure 4, trapping the material in sheet form (not shown).

In order to form a firm roll in which the layers do not slide over one another, an

auxiliary roller 19 is fitted that can move towards and away from the rolling-up member 2 by means of the arms 20. The auxiliary roller 19 comprises a number of discs 21 that are made of soft material, for example rubber, and are positioned alongside one another. When the material in sheet form is rolled up onto the rolling-up member 2 this material is subjected to firm contact pressure, so that a tightly wound roll is obtained.

After a roll has been formed, the flap 5 is flapped out of the way and the roll can be pushed off the rolling-up member 2 after the movable part 12 has been moved inwards.

The following may be mentioned as examples of metals from which the sheet material can be made: Al, Ti, Sc, Cu, Mg and Li.